

CLAIMS

5 1. – Module for heating the intake gases of an internal combustion engine, incorporating electronic temperature control which is used for heating the gases circulating through the intake pipe (13) by means of a heating element (1) connected to a battery (9) from which it receives a supply via a power control circuit (4) controlled by an electronic control unit (ECU) (12) of the engine, characterised in that it incorporates a frame (2) wherein:

10 - the power control circuit (4) is adhered, and
 - the heating element (1), consisting of a least one heating resistance, is installed,

15 both forming the same module to allow electronic control of the temperature of the intake gases.

20 2. – Module for heating the intake gases of an internal combustion engine, incorporating an electronic temperature control, according to Claim 1, characterised in that the power control circuit (4) incorporates essentially a control logic (8) to which is connected a temperature sensor (3), and at least one power switch (6) which controls the heating element (1).

25 3. – Module for heating the intake gases of an internal combustion engine, incorporating an electronic temperature control, according to Claims 1 and 2, characterised in that the power control circuit (4) is mounted on a ceramic base (1) adhered with a heat conducting product to the frame (2) itself.

30 4. – Module for heating the intake gases of internal combustion engine, incorporating an electronic temperature control, according to Claim 2, characterised in that the power control circuit (4) is provided with a power switch (6) for each of the heating resistances configuring the heating element (1).

5. - Module for heating the intake gases of internal combustion engine, incorporating an electronic temperature control, according to the preceding claims, characterised

- in that from the power control circuit (4) runs a supply connection (9) which is led to the positive terminal of the battery, an electrical conductor (5) which connects it to the heating element (1), which is in turn connected to the earth of the metal frame (2) at its other end, and a control connector (7) which transmits the temperature signals picked up by the temperature sensor (3) to the electronic control unit of the engine, which responds by transmitting signals to the control circuit (4) for regulating the power applied to the heating element (1) via the control logic (8) and the power switches (6).
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- 10 6. - Module for heating the intake gases of internal combustion engine, incorporating an electronic temperature control, according to Claims 1, 2 and 5, characterised in that the temperature sensor (3) is thermally connected to the frame (2), since it is integrated in the actual power control circuit (4) to provide the temperature control.
- 15 7. - Module for heating the intake gases of internal combustion engine, incorporating an electronic temperature control, according to Claims 1, 2 and 5, characterised in that the temperature sensor (3) is inserted in the wall of the intake manifold (14) for providing the temperature control.
- 20 8. - Module for heating the intake gases of internal combustion engine, incorporating an electronic temperature control, according to Claims 1, 2 and 5, characterised in that the temperature sensor (3) is integrated in the heating element (1) for providing the temperature control.
- 25 9. - Module for heating the intake gases of internal combustion engine, incorporating an electronic temperature control, according to Claims 1, 2 and 5, characterised in that the temperature sensor (3) is located downstream from the heating element (1).
- 30 10. - Module for heating the intake gases of internal combustion engine, incorporating an electronic temperature control, according to Claims 1, 2, 4 and 5, characterised in that the heating element (1) consists of at least one resistance of the strip type, with ceramic insulants (11) in which the resistance (1) is supported and expands in order to absorb expansions and avoid deformations.

11. - Module for heating the intake gases of internal combustion engine, incorporating an electronic temperature control, according to Claim 10, characterised in that there are separate ceramic insulants (11) for each resistance.
- 5 12. - Module for heating the intake gases of internal combustion engine, incorporating an electronic temperature control, according to Claim 10, characterised in that the ceramic insulants (11) form a single monobloc part which includes all the resistances.
- 10 13. - Module for heating the intake gases of internal combustion engine, incorporating an electronic temperature control, according to Claim 1, characterised in that it is installed in manifolds composed of materials with a low operating temperature.
- 15 14. - Module for heating the intake gases of internal combustion engine, incorporating an electronic temperature control, according to Claim 13, characterised in that it is installed in a plastic intake manifold.
- 20 15. - Module for heating the intake gases of internal combustion engine, incorporating an electronic temperature control, according to Claim 1, characterised in that the frame (2) is of metal, preferably aluminium.
- 25 16. - Module for heating the intake gases of internal combustion engine, incorporating an electronic temperature control, according to Claims 7, 8 and 9, characterised in that the connection of the temperature sensor (3) to the control circuit (4) is made by means of cables (15).
- 30 17. - Module for heating the intake gases of internal combustion engine, incorporating an electronic temperature control, according to Claim 16, characterised in that an additional connector (16) is arranged between the cable (15) and the temperature sensor.
18. - Module for heating the intake gases of internal combustion engine, incorporating an electronic temperature control, according to Claim 5, characterised

in that the electrical conductor (5) is integrated and hermetically sealed inside the module to prevent tampering and possible supply of the heating element (1) from the outside.